IN THE CLAIMS

1. (Previously Presented) A self-mode locked multi-section semiconductor laser diode, comprising:

a DFB laser section and a cavity (including a phase control section and an amplifier section), the strength and phase of a light beam, which propagate through the cavity and is then fed back to the DFB laser section, are controlled by injection currents of the amplifier section and the phase control section and are varied to obtain a wide frequency, wherein

the DFB laser section includes a complex-coupled diffraction grating and an active structure for controlling the intensity of laser light, to oscillate the laser light in a specific single mode independent of a phase variation of feedback laser light; the cavity including the phase control section and the amplifier section, the phase control section having a passive waveguide that controls a phase variation of the feedback laser light, the amplifier section having an active structure that controls the strength of the feedback laser light, wherein the strength and the phase of the feedback laser light are controlled to vary the frequency of an optical pulse produced by the laser diode; and

the DFB laser section and the cavity being monolithically integrated on a single substrate, current being independently injected into each of the sections,

wherein the complex-coupled grating of the DFB laser section is a loss-coupled grating formed of InGaAs, which longitudinally periodically varies both effective refractive index and loss,

wherein each of the active structures included in the DFB laser section and the amplifier section is formed in a manner in which a first light guiding layer, an active layer, and a second light guiding layer are sequentially deposited,

wherein the guiding layer of the phase control section is arranged through butt-coupling such that its central axis accords with those of the active structures.

2. (Previously Presented) The self-mode locked multi-section semiconductor laser diode as claimed in claim 1, wherein the DFB laser section and the cavity are monolithically integrated in accordance with a PBH structure.

3. (Previously Presented) The self-mode locked multi-section semiconductor laser diode as claimed in claim 1, wherein the DFB laser section and the cavity are monolithically integrated in accordance with a ridge structure.

4. (Cancelled)

5. (Previously Presented) The self-mode locked multi-section semiconductor laser diode as claimed in claim 1, wherein the complex-coupled grating of the DFB laser section is a gain-coupled grating constructed in a manner in which a diffraction grating is formed in an active layer, which longitudinally periodically varies both refractive index and gain.

6. (Cancelled)

7. (Previously Presented) The self-mode locked multi-section semiconductor laser diode as claimed in claim 6, wherein each of the first and second light guiding layers is formed of InGaAsP having a band gap of 1.3μm and has a thickness of 70nm, and the active layer has a multi-quantum-well structure with a band gap of 1.55μm including wells and barriers according to InGaAsP.

8. (Previously Presented) The self-mode locked multi-section semiconductor laser diode as claimed in claim 6, wherein each of the first and second light guiding layers is formed of InGaAsP having a band gap of 1.3μm and has a thickness of 70nm, and the active layer is formed of InGaAsP having a band gap of 1.55μm.

9. (Cancelled).

10. (Previously Presented) The self-mode locked multi-section semiconductor laser diode as claimed in claim 9, wherein the guiding layer has a thickness of 400nm and is made of InGaAsP having a band gap of 1.3μm.

11. (Original) The self-mode locked multi-section semiconductor laser diode as claimed in claim 1, wherein the DFB laser section, the phase control section, and the amplifier section are constructed through evanescent-coupling in which the sections have a common guiding layer.

12. (Original) The self-mode locked multi-section semiconductor laser diode as claimed in claim 1, wherein the phase control section is located between the DFB laser section and the amplifier section.

13. (Original) The self-mode locked multi-section semiconductor laser diode as claimed in claim 1, wherein the amplifier section is located between the DFB laser section and the phase control section.

14. (Original) The self-mode locked multi-section semiconductor laser diode as claimed in claim 1, wherein the facet of the DFB laser section is coated with an anti-reflection film, whereas the facet of the external cavity, opposite to the facet of the DFB laser region, is coated with a high-reflection film or is left as cleaved.

15. (Cancelled)